



Analysis of Psychomotor and Biomotor Factors on Skills Field Tennis Serving Skills at the Family Tennis Club

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ARTICLE INFO

Article history:

Received Oct 21, 2023

Revised Oct 25, 2023

Accepted Oct 28, 2023

Keywords:

Biomotor Factors;
Psychomotor Factors;
Serving skills.

ABSTRACT

The objective of this research is to know the effect of balance, hand eye coordination as a psychomotor factor and arm muscle strength, backswing flexibility, leg muscle explosive power as a biomotor factor on tennis service skills at the family tennis club. This research used the correlational research. The population of this research is total 31 players at the family tennis club. The sample in this study were 31 players at the family tennis club. The data analysis technique used inferential test on regression statistics. The results of hypothesis testing show: 1) there is a balance effect as a significant psychomotor factor on tennis service skills at the family tennis club; 2) there is a hand eye coordination effect as a significant psychomotor factor on tennis service skills at the family tennis club 3) there is a arm muscle strength effect as a significant biomotor factor on tennis service skills at the family tennis club; 4) there is a backswing flexibility effect as a significant biomotor factor on tennis service skills at the family tennis club; 5) there is a leg muscle explosive power effect as a significant biomotor factor on tennis service skills at the family tennis club. So from the statement above it can be concluded that 1) there is an influence of psychomotor factors on the skills of serving tennis at the family tennis club, and 2) there is an influence of biomotor factors on the skills of serving tennis at the family tennis club.

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INTRODUCTION

Field tennis is a sport that attracts a lot of attention from people around the world, including people in Indonesia. This is because this form of sport can be played by various age groups, from children, teenagers, adults to the elderly, even if they are still strong enough and do not have certain types of diseases so doctors are prohibited from playing tennis. The basic principle in a tennis game is to hit the ball before or after it bounces on the floor over the net and into the opponent's playing field (Maulidin et al., 2021). Also, every tournament or match promises quite big prizes, so it is not surprising that many people take up tennis. According to (Budi et al., 2022), in tennis there are several basic skills that a player must master in order to become a good player,

including serves, volleys, drive ground strokes and smashes. According to (Maqbulatullah et al., 2022) court tennis requires agile movements in carrying out basic techniques, so that each player must master basic techniques and have a good physique. However, the focus of this research is only on one basic technique, namely serving. In the game of tennis there are several basic stroke techniques that need to be mastered, one of which is the technique of hitting the serve (Wiwin et al., 2017). According to (Brown, 2007) the serve is one of the most important hitting techniques in tennis, because the purpose of the serve is to open the game or start the game, as well as the initial attack to score points. In a tennis court game each player gets two chances to serve if the first serve is failed then there is a second chance but if it still fails then the player loses points (Yusuf & Suriatno, 2022). Compared to other sports, tennis has its own characteristics. Tennis is characterized by basic serving techniques. Meanwhile, according to (Yasruddin & Wahyudin, 2017) in tennis, two balls can be used to perform a double serve to produce points, which means a player has two serving opportunities. If a double fault occurs on the first ball, the player can use the second ball to serve. A failed or missed serve means the player loses the opportunity to get points (Prastyo et al., 2012). Therefore, players must be able to serve accurately and powerfully, with the aim of closing or breaking through the opponent's defense so that it is easier to take subsequent shots which makes it easier to score points. So the service technique must be trained and learned for field tennis players intensely and regularly because this technique is a prefix technique when playing field tennis (Malo & Nurhidayat, 2021). The game of tennis requires a lot of skill and physical ability, technique, tactics and mentality. mental is a unity that supports each other (Maulidin et al., 2021). Mastery of technical skills must of course be supported by good physical condition (Naldi, 2023).

In any sport, be it individual, team or game sports, it is greatly influenced by the factors that determine the success of the sport, both intrinsic (from within the body) and extrinsic (from the surrounding environment). According to (Putra et al., 2017) these factors include: technical, tactical, mental, biomotor (physical), psychomotor, anthropometric, motivation, nutrition, genetics, and others. The psychomotor domain concerns movement behavior or body control (Putra et al., 2016). Meanwhile, the physical or biomotor domain concerns physical work capacity. The psychomotor domain and the biomotor domain are actually almost the same, the two cannot be separated but can only be differentiated because they always function together. Conceptually the two are different from each other. Meanwhile, according to (Wahab, 2022) biomotor and psychomotor play a very important role in maintaining or increasing the level of physical fitness. According to (Sepdanius, 2019) The degree of a person's physical fitness can determine their physical ability in carrying out daily tasks. The higher the degree of physical fitness, the higher the physical work ability in carrying out daily tasks. In other words, his work results will be more productive if his physical fitness increases. Biomotor and psychomotor training is the main program in developing athletes to excel in sports. Athletes who have good biomotor and psychomotor levels will avoid injury. Psychomotor manifests itself through a complete set of coordination abilities, linked to a good level of kinesiology and balance in a good determination of the environment (Alexandru & Lorand, 2015). According to (Maqbulatullah et al., 2022) Psychomotor skills refer to: simple reaction, discrimination reaction time and reaction time to complex stimuli, eye-hand coordination and intersegmental coordination (manifested under different conditions), focus of attention, topographical memory, analogical transfer ability (accuracy and rapid response), alertness and mental toughness. According to Ferrauti et al., 2002 in (Yapıcı et al., 2018) Tennis is an achievement sport that requires aerobic and anaerobic loads to be at a good level in biomotor traits such as strength, speed, endurance, flexibility, and coordination. The basic motor qualities of an individual consist of the elements that determine the person's body strength and ability and the degree of complex motor power (PT, 2023).

According to (Zırhlı & Demirci, 2020) These qualities are the basis and primary conditions for any motor sport movement performed during the training process. To achieve serving results in tennis requires practice, because serving is the basis of a tennis player's performance. However, in

order to serve well, a player must be able to combine various components such as psychomotor and biomotor factors to obtain good serving skills. This is because it is difficult to master and develop good serving techniques without these factors. On the other hand, if the supporting factors are sufficient, the service execution will be perfect. This situation is a problem that must be looked for, and one effort is to conduct research, especially related to the factors that support players to play tennis well. Based on the explanation above, it can be said that a person's psychomotor and biomotor components are related to their ability to serve on a tennis court. The psychomotor and biomotor components have many factors, when related to field tennis services, the influencing factors are, in the psychomotor domain, they consist of coordination, in this case hand-eye coordination and balance. Meanwhile, the biomotor chain consists of strength, where the strength in question is the strength of the arm muscles, flexibility, where the flexibility in question is the flexibility of the backbone, and explosive power, where the explosive power in question is the explosive power of the leg muscles. Researchers are interested in finding out how much influence these factors have on a person's ability and skills in serving tennis, so that later it can be used as a reference and basis for creating training programs to improve the ability and skills of serving tennis. So, on this basis, the researcher wants to conduct research with the title: "Analysis of dominant biomotor and psychomotor factors on field tennis service skills at the Family Tennis Club".

RESEARCH METHODOLOGY

This research technique uses descriptive statistical analysis of frequency (Gomm, 2008). Based on the problem and research objectives, the method used in this research is correlational (Ali Maksum, 2012). Correlation is research that has the aim of collecting information regarding the relationship status of the variables being tested. The purpose is to test whether there are symptoms that occur between these variables or not (Purba et al., 2023). The aim of this research is to determine psychomotor and biomotor factors on court tennis service skills at the Family Tennis Club. The sample is part of the entire population that represents all members of the population and has the same traits, traits and characteristics to be able to represent all members of the population (Rahmadani et al., 2023). To obtain research results, the sample used was tennis athletes from the Makassar Family Tennis Club.

RESULTS AND DISCUSSIONS

Empirical data obtained in the field through tests and measurements consisting of: balance, hand-tennis eye coordination, arm muscle strength, backbend flexibility, muscle explosive power, fitness and tennis service skills at the family club, were then analyzed using descriptive statistical techniques and inferential statistics. Descriptive data analysis is intended to obtain a general overview of the research data, then proceed with testing the analysis requirements, namely the data normality test. Meanwhile, inferential data analysis is intended to obtain results of testing the hypotheses proposed in this research.

The results of data normality testing using the Kolmogrov-Smirnov (KS-Z) test show the following results:

1. For data on field tennis service skills, the value obtained is $KS-Z = 0.111$ ($P = 0.200 > 0.05$), so it can be concluded that data on field tennis service skills follows a normal distribution or normal distribution.
2. For balance data, the value obtained is $KS-Z = 0.138$ ($P = 0.138 > 0.05$), so it can be concluded that the balance data follows a normal distribution or is normally distributed.
3. For eye hand coordination data, the value obtained was $KS-Z = 0.139$ ($P = 0.133 > 0.05$), so it can be concluded that the eye hand coordination data follows a normal distribution or is normally distributed.

4. For arm muscle strength data, the KS-Z value = 0.147 ($P = 0.086 > 0.05$), so it can be concluded that the arm muscle strength data follows a normal distribution or normal distribution.
5. For the backstab flexibility data, the value obtained is KS-Z = 0.152 ($P = 0.065 > 0.05$), so it can be concluded that the backstab flexibility data follows a normal distribution or normal distribution.
6. For leg muscle explosive power data, the value obtained was KS-Z = 0.150 ($P = 0.072 > 0.05$), so it can be concluded that the leg muscle explosive power data follows a normal distribution or normal distribution.

The description of the Kolmogorov Smirnov normality test for each group of data can be summarized in the following table:

Table 1.
Kolmogorov smirnov normality test

	Balance	Eye Coordination Hand	Arm Strength	Togok Flexibility	Leg Explosive Power	Service Skills
Sample	31	31	31	31	31	31
Kolmogorov-Smirnov Z	.138	.139	.147	.152	.150	.111
Asymp. Sig. (2-tailed)	.138	.133	.086	.065	.072	.200

The influence of balance as a psychomotor factor on tennis service skills at the family tennis club

Table 2.
Test the linearity of the regression of tennis service skills on the balance variable

		Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)	3498.360	113	269.105	2.903	.021
	Linear	1907.561	11	1907.561	20.579	.000
	Term Deviation	1590.799	112	132.567	1.430	.243
Within Groups		1575.833	117	92.696		
Total		5074.194	330			

From the table above, to test the linearity of the regression of tennis service skills (Y) on the balance variable (X1), the Fcount (Tc) is 1.430 with p-value = 0.243 > 0.05 , this means that Ho is accepted. Thus it can be concluded that the form of the regression equation $\hat{Y} = 2.865 + 0.189X1$ is linear. Meanwhile, the regression significance test obtained an F-value of 17,469, and p-value = 0.000 < 0.05 . This means that Ho is rejected, thus indicating that the form of the regression equation $\hat{Y} = 2.865 + 0.189X1$ is significant.

Table 3.
Summary of regression analysis results

Jumlah Observasi (n)	Koefisien Korelasi ($r_{x1,y}$)	Koefisien Determinasi ($r^2_{x1,y}$)	P-value	Sig
31	0.613	0.376	0,000**	0.05

The table above displays the magnitude of the influence caused by the independent variables (predictors) which are expressed in percentages based on the coefficient of determination at R square = 0.376. These results mean that 37.60% of the variation in family tennis club court tennis service skills can be explained by balance as a psychomotor factor.

The influence of hand eye coordination as a psychomotor factor on court tennis service skills at a family tennis club

Table 4.

Test the linearity of the regression of field tennis service skills on the hand eye coordination variable

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		69,501	113	5,346	1,582	,186
	Linear	Weighted	55,667	11	55,667	16,468	,001
	Term	Deviation	13,834	112	1,153	,341	,968
Within Groups			57,467	117	3,380		
Total			126,968	330			

From the table above, to test the linearity of the regression of field tennis service skills (Y) on the hand eye coordination variable (X2), the Fcount (Tc) was obtained 0.341 with p-value = 0.968 > 0.05, this means Ho is accepted. Thus it can be concluded that the form of the regression equation $\hat{Y} = 3.804 + 1.291X_2$ is linear. Meanwhile, the regression significance test obtained an F-value of 22.641, and p-value = 0.000 < 0.05. This means that Ho is rejected, thus indicating that the form of the regression equation $\hat{Y} = 3.804 + 1.291X_2$ is significant.

Table 5.

Summary of regression analysis results

Jumlah Observasi (n)	Koefisien Korelasi ($r_{x_2,y}$)	Koefisien Determinasi ($r^2_{x_2,y}$)	P-Value	Sig
31	0.662	0.438	0,000**	0.05

The table above shows the magnitude of the influence caused by the independent variables (predictors) which are expressed in percentages based on the coefficient of determination at R square = 0.438. These results mean that 43.80% of the variation in family tennis club court tennis service skills can be explained by hand eye coordination as a psychomotor factor.

The influence of arm muscle strength as a biomotor factor on field tennis service skills at family tennis clubs

Table 6.

Test the linearity of the regression of field tennis service skills on the variable arm muscle strength

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		2943,667	113	226,436	3,239	,013
	Linear	Weighted	1607,066	11	1607,066	22,990	,000
	Term	Deviation	1336,601	112	111,383	1,593	,185
Within Groups			1188,333	117	69,902		
Total			4132,000	330			

From the table above, to test the linearity of the regression of field tennis service skills (Y) on the variable arm muscle strength (X3), Fcount (Tc) was obtained 1.593 with p-value = 0.185 > 0.05, this means Ho is accepted. Thus it can be concluded that the form of the regression equation $\hat{Y} = 13.490 + 0.213X_3$ is linear. Meanwhile, the regression significance test obtained an F-value of 18,458, and p-value = 0.000 < 0.05. This means that Ho is rejected, thus indicating that the form of the regression equation $\hat{Y} = 13.490 + 0.213X_3$ is significant

Table 7.

Summary of regression analysis results

Jumlah Observasi (n)	Koefisien Korelasi ($r_{x_3,y}$)	Koefisien Determinasi ($r^2_{x_3,y}$)	P-Value	Sig

31	0.624	0.389	0,000**	0.05
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The table above shows the magnitude of the influence caused by the independent variables (predictors) which are expressed in percentages based on the coefficient of determination at R square = 0.389. These results mean that 38.90% of the variation in family tennis club court service skills can be explained by arm muscle strength as a biomotor factor.

The influence of backbone flexibility as a biomotor factor on tennis skills at the family tennis club

Table 8.

Test the linearity of the regression of tennis service skills on the backstroke flexibility variable

			Sum of Squares	df	Mean Square	F	Sig.
Between Groups	(Combined)		799,594	113	61,507	4,355	,003
	Linear	Weighted	460,210	11	460,210	32,587	,000
	Term	Deviation	339,384	112	28,282	2,003	,093
Within Groups			240,083	117	14,123		
Total			1039,677	330			

From the table above, to test the linearity of the regression of tennis service skills (Y) on the backstroke flexibility variable (X4), the Fcount (Tc) is 2.003 with p-value = 0.093 > 0.05, this means Ho is accepted. Thus it can be concluded that the form of the regression equation $\hat{Y} = 13.228 + 0.453X4$ is linear. Meanwhile, the regression significance test obtained an F-value of 23.032, and p-value = 0.000 < 0.05. This means that Ho is rejected, thus indicating that the form of the regression equation $\hat{Y} = 13.228 + 0.453X4$ is significant.

Table 9.

Summary of regression analysis results

Jumlah Observasi (n)	Koefisien Korelasi ($r_{yx4,y}$)	Koefisien Determinasi ($r^2_{x4,y}$)	P-value	Sig
31	0.665	0.443	0,000**	0.05

The table above displays the magnitude of the influence caused by the independent variables (predictors) which are expressed in percentages based on the coefficient of determination at R square = 0.443. These results mean that 44.30% of the variation in family tennis club court tennis service skills can be explained by backbone flexibility as a biomotor factor.

The influence of muscle spasm explosive power as a biomotor factor on field tennis skills in the service tennis family club

Table 10.

Test the linearity of the regression of field tennis service skills) on the variable explosive muscle spasm power

			Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	(Combined)		929,297	113	71,484	4,252	,003
	Linear	Weighted	659,457	11	659,457	39,226	,000
	Term	Deviation	269,840	112	22,487	1,338	,284
Within Groups			285,800	117	16,812		
Total			1215,097	330			

From the table above, to test the linearity of the regression of field tennis service skills (Y) on the variable explosive muscle spasm power (X5), the Fcount (Tc) was obtained 1.338 with p-value =

0.284 > 0.05, this means H_0 is accepted. Thus it can be concluded that the form of the regression equation $\hat{Y} = -2.633 + 0.464X_5$ is linear. Meanwhile, the regression significance test obtained an F-value of 34,418, and p-value = 0.000 < 0.05. This means that H_0 is rejected, thus indicating that the form of the regression equation $\hat{Y} = -2.633 + 0.464X_5$ is significant.

Table 11.
Summary of regression analysis results

Jumlah Observasi (n)	Koefisien Korelasi ($r_{x_5,y}$)	Koefisien Determinasi ($r^2_{x_5,y}$)	P-value	Sig
31	0.737	0.543	0,000**	0.05

The table above displays the magnitude of the influence caused by the independent variables (predictors) expressed in percentages based on the coefficient of determination at R square = 0.543. These results mean that 54.30% of the variation in family tennis club court service skills can be explained by muscle spasm explosive power as a biomotor factor.

CONCLUSION

The research results showed that there was a significant influence of various psychomotor and biomotor factors, such as balance, hand-eye coordination, arm muscle strength, spinal strength, and spasmodic muscle strength, on service skills in field sports. This indicates that this research has provided deeper insight into aspects of tennis skill that may not have previously received much attention. In addition, this research also provides practical suggestions that coaches can implement to improve tennis serving skills. The uniqueness of this research lies in its ability to provide direct guidance that coaches can utilize, helping them understand the role of these factors in the context of sports training. This research adopts a holistic approach by simultaneously considering physical and motor factors in understanding sports skills. This approach reflects relatively new developments in exercise science, and provides a basis for further research that digs deeper into the relationship between these factors and exercise performance. In addition, this study proposes that future research should explore additional indicators or variables to develop sports science. These suggestions provide an impetus for researchers to explore new aspects of sport science, creating opportunities to improve understanding of the factors influencing sport performance and the development of knowledge in this field. In conclusion, this research provides in-depth insight into the factors that influence service skills in the sport of tennis, provides practical guidance for coaches, brings a holistic approach to sports science, and opens the door for future research. This research provides a strong basis for further developments in sports science, especially in the context of skill improvement in field tennis.

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